

Remarks

Claims 1-18 remain in the application.

The amendment to the text on page 3 corrects a drafting error that would have been obvious to one of ordinary skill of the art in plasma sputter reactors.

The examiner has rejected claim 8 under 35 U.S.C. §112, ¶2 for indefiniteness. The problem arose from a keyboarding error in which a partial phrase duplicating some of the previous recitation follows the intended claim. The amendment removes partial phrase.

The examiner has rejected claims 1, 4, and 5 under 35 U.S.C. §102(a) as being anticipated by Fai Lai (US Patent 6,217,716). This rejection is traversed. The examiner cites Fai Lai's magnetic means 129 in FIG. 10. The invention of claim 1 requires that the magnetic means not extend above a back the roof. In contrast Fai Lai's magnets 129 extend well in back of the closed end (roof) 130 of his hollow cathode 132. Accordingly, claim 1 and its dependent claims should be allowed.

A new dependent claim 9 has been amended to require the magnetic means to be in front of the front sputtering surface of the target roof, as clearly supported in FIG. 9 and clearly not taught by Fai Lai.

The examiner has rejected claims 1, 4, 5, and 6 under 35 U.S.C. §102(a) as being anticipated by Lai et al. (US Patent 6,444,105, hereafter Lai or Lai '105). This rejection is traversed. The examiner refers to Lai's magnets 11 in FIG. 3A. The invention of claim 1 requires that the magnetic means not extend above a back the roof. In contrast, at least two of Lai's stacked magnets 11 extend above the slightly curved roof of Lai's target 3. The claim is phrased in language of means plus function. As a result, they must be equivalent to the structure of Lai and not to only a part of it. All of Lai's stacked magnets are important to the function of his magnet stack. Accordingly, claim 1 and its dependent claims are not anticipated by Lai.

The examiner has rejected claims 1-3 and 8 under 35 U.S.C. §103(a) as being obvious over Fai Lai or Lai (U.S. Patent 6,217,716, hereafter Lai '716), Lai '105) in view of Gopalraja et

al. (EP 1119017). This rejection is traversed. Fai Lai and Lai '105 have previously distinguished. Lai '716 teaches no more for the claims since it discloses a substantially similar reactor for purposes of the claims. Most obviously, Gopalraja discloses the magnetic means associated with an annular vault while Fai Lai, Lai '105, and Lai '716 disclose magnetic means associated with a cylindrical vault. The physics and geometry are sufficiently distinct that the justification for combining features of the two distinctly different chambers must be more than "achieving a desired erosion pattern." Gopalraja's pair of cylindrically arranged sidewall magnets operate distinctly differently than Fai Lai's and the others' single cylindrically arranged sidewall magnet. Gopalraja's pair are polarized in opposite direction and hence produces magnet field that closes the throat of the vault with a smoothly varying magnetic field line. See Gopalraja's FIG. 12. Fai Lai's single sidewall magnet has just the opposite effect and is intended to create the cusp or zero 107 of Lai 105's FIG. 1. Further, even the stated suggestion by Gopalraja at col 19, ll. 22 is directed to the inclusion or non-inclusion of a spacer between magnets, not to the existence of magnets and the polarities. The spacer is not being claimed. An engineer or physicist of ordinary skill would understand that the passage is directed to the erosion of the inner target sidewall. Further, the cited passage is describing the magnet on Gopalraja's inner sidewall. This inner sidewall and the inner sidewall magnet do not even exist in Fai Lai or either Lai and is not allowed by the cylindrical vault and disk shaped roof recited in parent claim 1. As a result, the cited passage of Gopalraja can not be interpreted to mean that his roof magnet may be used to achieve the desired erosion of a part of the target not existing in the claim or other cited art..

Claim 3 further requires that the magnetic polarity of the outer pole of the roof magnet be the same as the polarity of the single sidewall magnet. Gopalraja's roof magnet is parallel to the outer sidewall magnet 222 and anti-parallel to the inner sidewall magnets 226, 228. Certainly, Gopalraja does not clear teach which of these two relationships should be applied to the distinctly different geometry of Fai Lai and either Lai. Hence, claim 3 is further non-obvious over the stated combinations.

The examiner has rejected claims 1 and 7 under 35 U.S.C. 103(a) as being obvious over Lai '716 or Lai '105 in view of Haag et al. (US Patent 6,337,001, hereafter Haag), Glocker et al.

(US Patent 5,069,770, hereafter Glocker), and Kumar (US Patent 5,178,743). The rejection is similarly traversed. The requirement of at least four references to reject relatively simple claims suggests hindsight and selective reconstruction of many disparate reference.

It is not seen how the added references supply the deficiencies of the previously discussed rejections of claim 1 so that claim 1 and dependent claim 7 should be held allowable.

The two Lai references have been previously distinguished for claim 1 and seem to add nothing for the added restrictions of claim 7. Haag discloses a type of ion gun including a flow of gas through the target assembly, a feature lacking in either Lai reference. The combination of Haag and either Lai reference is unobvious. There is no suggestion for combining the features of an ion gun with a diode sputtering target. The two have existed for decades without any thought of combining them. Further, the examiner justifies the combination of a closed throat by citing the increased plasma density taught by Haag at col. 3, lines 2, 3. The examiner misinterprets this passage. Haag is referring to the closed plasma loop of Haag's racetrack ion gun. The passage is not referring to a closed throat of the gun. Haag's FIG. 8 does have a partially closed throat. However, as Haag seems to describe at col. 5, ll. 8-30, the narrowing saves gas and builds up pressure and is not described to increasing the plasma density. Such an effect is totally irrelevant to Lai's closed cylindrically vaulted target. The racetrack clearly shown by Haag in many of his figures has resemblances to the Gopalraja's annular vault, not the cylindrical vault of either Lai or of claim 1.

Glocker similarly discloses an ion gun though without the gas flow through the target. Glocker's scant description of his partially closed throat at col. 2, lines 22-32 refers to the target forming "a substantially enclosed sputtering chamber C having one or more relatively small orifices" In contrast, Lai forms a sputtering chamber mostly outside of his cylindrically vaulted target with the sputtering anode being located outside of the vault toward the target. Glocker's description at col. 2, line 54 that the enclosed geometry confines the plasma is pertinent to ion guns and not otherwise open sputtering targets. Glocker's confined geometry causes a cosine distribution of the ions (col. 2, line 65), not a feature considered important in magnetron diode sputtering. The enclosed plasma in a sputter gun prevents isotropic sputtering of the

outside of the target. There is no suggestion in either Lai reference of completely maintaining the plasma within their cylindrical vault. In fact, they emphasize a cusp point outside the vault. There is simply no suggestion for adapting the partially closed throat of an ion gun with the sided sputtering targets of the cited art.

Both Haag and Glocker place their anode inside their target while, as stated above Lai places the anode outside. Dependent claims have been added which recite details of the target continuity and placement of the anode, recitations inconsistent with the target guns of Haag and Glocker having anodes inside the target.

It is very difficult to combine Kumar with the Lai references or even the Haag and Glocker references. Kumar discloses magnetron diode sputtering apparatus but in a geometry and use totally foreign to Lai. Kumar's cylindrically shaped cathode target 4 is closed except for small apertures on its two axially ends for two tubular anodes 6 through which a continuous film or thread 76 passes for continuous sputter coating of material passed between two spools 78, 80. The geometry is totally not useful for the wafer or stationary substrate coating of the other references. Kumar's sputter reactor is confined substantially to within the target while, as discussed before, Lai's reactor includes other necessary items outside the target. No ordinary mechanic inspecting Kumar's continuous sputter coater would be tempted to apply its closed geometries to the open ended target of Lai. While it is true that Kumar's reactor of FIG. 3 confines the plasma to within his tubular target, Kumar does not teach the advantage of doing so, at least in the context of a substrate outside of the target.

Kumar at col. 3, ll. 15-20 teach how the planar geometries of Lai are extremely disadvantageous. Kumar instead substitutes a totally different geometry in place of Lai and not as a substitution of isolated parts in Lai. The examiner is selectively applying Kumar's teaching. The reference must be read as a whole. Accordingly, this rejection should be removed.

The examiner has rejected claims 1-8 for obviousness type double patenting over claims 1-35 of US Patent 6,743,342 in view of Gopalraja and Lai. A Terminal Disclaimer submitted herewith should remove this rejection.

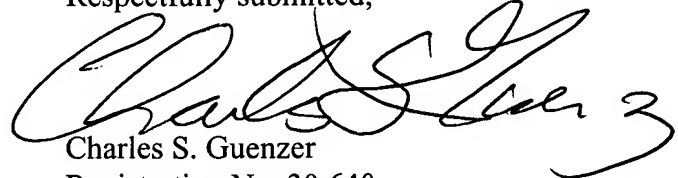
Two new sets of claims have been added having the general scope of some of the amended

claims discussed above.

In view of the above amendments and remarks, reconsideration and allowance of all claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the undersigned attorney at the listed telephone number, which is on California time.

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